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Research article

Traditional method of disease classification, and identification of medicinal plants and mushrooms by Raji ethnic people in western Nepal

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Abstract

Rajis are indigenous people distributed in mid and far western parts of Nepal. They have immense knowledge and traditional practices on utilization of plant resources as food and medicine. The present study was conducted in Surkhet and Kailali districts of western Nepal to document the Raji's knowledge on medicinal plants and mushrooms. A total of 57 species of vascular plants belonging to 50 genera and 33 families were reported as the medicinal plants traditionally being utilized by the Raji people. They have classified the human diseases into six categories according to various symptoms. Traditionally, the medicinal plants are identified by the healers based on the type of plant sap and smell. Mushroom colour, taste, morphology, and type of host plants are the basic criteria for identifying edible and poisonous mushrooms by the Rajis. Therefore, this wealth of information among the Raji people should be conserved.

Key-words: Indigenous people, medicinal plants, mushroom poisoning, traditional skills.

Introduction

Nepal is the richest country having diversity in castes, religions, cultures and traditions. There are 125 caste/ethnic groups and 123 languages spoken as the mother languages in Nepal (CBS 2011). Among them, the indigenous nationalities have their own mother tongue, folk culture, beliefs and practices (Gellner *et al*. 2012). They have developed valuable knowledge, cultures and traditions depending on the climate and ecology where they inhabit (Maskey 2007).

The Rajis are one of the indigenous peoples of Nepal distributed in mid and far western regions having strong knowledge and belief in traditional healing system (Maskey 2007; Thapa 2012; Thapa *et al*. 2013). National Federation of Indigenous Nationalities (NEFIN) has categorized the Rajis as an endangered ethnic group. The Rajis are in great pressure to change their traditional practices and belief system on utilization of natural resources due to increasing population, urbanization, migration and modernization (Maskey 2007; Gurung, 2009; Thapa 2012). Therefore, their traditional knowledge on plant resources is about to extinct (Thapa *et al*. 2014).

Traditional knowledge and practices of indigenous people should be linked with the process of scientific research to develop new hypotheses for further researches and experiments (Henfrey 2002). Hence, the studies and documentation of such knowledge have a great significance in the field of biological, medical and social sciences (Balick and Cox 1997; Huntington 2000). Maskey (2007) and Thapa (2012) had previously studied and highlighted the indigenous knowledge and practices of Raji people at Surkhet district. Thapa *et al*. (2014) have also listed 43 plant species belonging to 40 genera and 29 families used by Raji people for the treatment of gastrointestinal disorders. The present work aims to document the medicinal plants used by Rajis for different types of human diseases other than gastro-intestinal disorders. In addition, the study

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highlights the traditional methods of human disease classification and identification of medicinal plants and mushrooms by the Rajis in Surkhet and Kailali districts of Nepal.

Materials and Methods

The study was conducted in Surkhet and Kailali Districts of Nepal from 2013 to 2014. A total of 77 households were surveyed. The villages were Uttarganga (Birendranagar Municipality), Chhinchu (Bheri Ganga Municipality) and Ghatgaun (Chaukune Rural Municipality) of Surkhet district, and Chaumala (Gauri Ganga Municipality) and Khailad (Bhajani Municipality) of Kailali district. A standard questionnaire was prepared for interview to meet the objectives of study. Household heads and the key informants, Dhami-jhankris, traditional healers, and plant users were interviewed to collect primary data. The respondents were 17 to 72 years old. Focus group discussions were also carried out among the villagers, healers, and persons having indigenous knowledge.

Transect walk surveys to identify medicinal plants and the host plants of mushrooms were conducted with the selected key informants. The plant specimens were collected, tagged and identified with the help of standard literatures. The collected plant specimens were deposited at Tribhuvan University Central Herbarium (TUCH), Kirtipur, Kathmandu, Nepal.

Results

MEDICINAL PLANTS USED BY RAJIS

A total of 57 species of plants were reported as medicinal, which are traditionally being utilized by Raji people. The medicinal plants belonged to 50 genera and 33 families (Table 1, Figure 1). Among them, 11 species of 8 families were monocots and the rest of the species (of 25 families) were dicots. Moraceae and Lamiaceae were the largest families each having 6 medicinally important species, followed by Fabaceae (4 species), Euphorbiaceae (3 species), Poaceae (3 species) and Solanaceae (3 species). The families Cucurbitaceae, Zingiberaceae, Sapindaceae and Rutaceae were represented by 2 species and rest of the families were represented by single species (Table 1).

Based on the habit of plants, 22 species were trees (39%), 17 species were herbs (30%), 14 were shrubs (24%) and 4 species were climbers (7%) (Figure 1). These species were used to treat 38 types of diseases. Regarding the use forms, most of the medicinal plants were used in the form of juice (30 species), followed by paste (18 species), sap (7 species), latex (5 species), and 2 species (*Cleistocalyx operculatus* and *Datura stramonium*) were used in the form of dry leaf smoke for the treatment of asthma and sinusitis (Table 1, Figure 2).

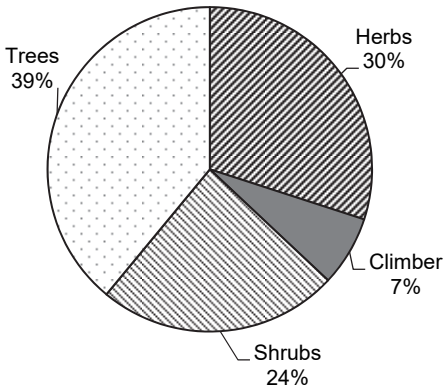

Figure 1. Habit of medicinal plants used by Raji people.

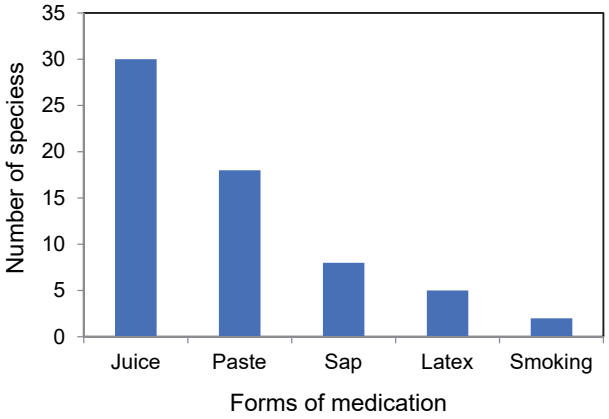

Figure 2. Forms of use of medicinal plants by Raji people.

Table 1. Medicinal plants used by Raji people (plant families, local and Raji name, habit, parts used, diseases and forms of use).

S. N.	Botanical name and family	Local and Raji name	Habit	Parts used[1]	Disease(s) treated	Forms of use
1.	*Acorus calamus* L. [Acoraceae]	L: Bojo; R: Bach	H	Rh	Cough, cold	Juice
2.	*Sagittaria trifolia* L. [Alismataceae]	Kanpate	H	Lf/Pt	Ear problem	Juice

S. N.	Botanical name and family	Local and Raji name	Habit	Parts used[1]	Disease(s) treated	Forms of use
3.	*Centella asiatica* (L.) Urb. [Apiaceae]	L: Ghod Tapre; R: Ghod-thapa	H	Wp	Fever	Juice
4.	*Calotropis gigantea* (L.) W.T. Aiton [Apocynaceae]	L: Ank; R: Madar	S	Lt	Joint swelling, snake bite	Latex
5.	*Nerium indicum* Mill [Apocynaceae]	L/R: Karauti	T	Sd	Wound, boil	Paste
6.	*Asparagus racemosus* Willd. [Asparagaceae]	L: Kurilo; R: Dhangsya	S	Rt	bone facture	Paste
7.	*Aloe vera* (L.) Burm. f. [Asphodelaceae]	L/R: Ghiu Kumari	H	Lf	Cut, wound, burning, stone, jaundice, dandruff	Leaf juice/paste
8.	*Ageratum conyzoides* L. [Asteraceae]	L: Boke Jhar; R: Boke	H	St/Lf	Cut, wound	Juice
9.	*Oroxylum indicum* (L.) Kurz [Bignoniaceae]	L: Maltata; R: Pranda	T	Fr/Sd	Burning wound	Paste
10.	*Carica papaya* L. [Caricaceae]	L/R: Mewa	T	Rt, Fr	Jaundice, stone	Latex/juice
11.	*Terminalia alata* Heyne ex Roth [Combretaceae]	L: Saj; R: Sajha	T	Lf	Dandruff	Juice
12.	*Floscopa scandens* Lour. [Commelinaceae]	L: Kane Jhar; R: Kane	H	Wp	Ear problem	Juice
13.	*Cuscuta reflexa* Roxb. [Convolvulaceae]	L: Akash Beli; R: Bamparang belau	C	Wp	Dandruff, hairfall, skin diseases	Paste
14.	*Coccinia grandis* (L.) Voigt [Cucurbitaceae]	L/R: Golkankri	C	Lf	Snake bite	Juice/paste
15.	*Cucumis callosus* (Rottb.) Cogn. [Cucurbitaceae]	L: Airelu; R: Goinva	C	Fr	Headache	Juice
16.	*Dioscorea bulbifera* L. [Dioscoreaceae]	L: Githa; R: Syak	C	Tb	Scorpion bite	Paste
17.	*Euphorbia hirta* L. [Euphorbiaceae]	L: Dudhe Jhar; R: Dudhe	H	Lt	Cut, wound	Latex
18.	*Euphorbia ligularia* Roxb. [Euphorbiaceae]	L: Siudi; R: Siun	S	Lt	Joint swelling	Latex
19.	*Jatropha curcas* L. [Euphorbiaceae]	L: Sajiwan; R: Ratanjo	T	Lt	Cut, wound, kerotolysis, pyorrhea	Latex
20.	*Acacia catechu* (L. f.) Willd. [Fabaceae]	L: Khayer; R: Khaira	T	Lt	Back pain	Juice
21.	*Bauhinia variegata* L. [Fabaceae]	L: Koiralo; R: Greainblack	T	Fl	Cut, wound	Juice
22.	*Cassia fistula* L. [Fabaceae]	L: Rajbrikshya; R: Maltokryan	T	Fr	Epilepsy	Fruit juice
23.	*Desmodium oojeinense* (Roxb.) H. Ohashi [Fabaceae]	L: Sadan; R: Pallan	T	Br	Dandruff, skin diseases	Sap
24.	*Colebrookea oppositifolia* Sm. [Lamiaceae]	L: Dhusure; R: Dhusan	S	Ys	Eye problem	Juice
25.	*Gmelina arborea* Roxb [Lamiaceae]	L/R: Khamari	T	Lf	Boils	Paste
26.	*Mentha arvensis* L. [Lamiaceae]	L: Pudina; R: Blaka	H	Lf	Fever, cough, cold, headache, chest pain	Juice
27.	*Ocimum basilicum* L. [Lamiaceae]	L: Babari; R: Babriphula	H	Lf	Cough, cold, headache,	Juice

S. N.	Botanical name and family	Local and Raji name	Habit	Parts used[1]	Disease(s) treated	Forms of use
					chest pain	
28.	*Ocimum tenuiflorum* L. [Lamiaceae]	L/R: Tulsi	H	Lf	Chest pain, cough, cold, headache	Juice
29.	*Pogostemon benghalensis* (Burm. f.) Kuntze [Lamiaceae]	L: Rudilo; R: Rudila	S	Rt/Lf	Fever	Juice
30.	*Leea crispa* Royen ex L. [Leeaceae]	L: Galaino; R: Pusaglyak	S	Rt	Boils, backbone pain	Paste
31.	*Woodfordia fruticosa* (L.) Kurz [Lythraceae]	L: Dhaayaro; R: Dhadare	T	Br	Burning wound	Paste
32.	*Thespesia lampas* (Cav.) Dalzell & Gibson [Malvaceae]	L/R: Ban Kapas	S	Lf	Boils	Paste
33.	*Azadirachta indica* A. Juss. [Meliaceae]	L/R: Neem	T	Wp	Jaundice, stone, fever	Juice
34.	*Artocarpus lakoocha* Wall. ex Roxb. [Moraceae]	L/R: Badhar	T	Br	Cut, wound, gland swelling	Sap
35.	*Ficus auriculata* Lour. [Moraceae]	L: Timila; R: Bhutuk	T	Br	Cut, wound, swelling	Sap
36.	*Ficus benghalensis* L. [Moraceae]	L: Bar; R: Barnang	T	Br	Cut, wound, pain, eye problem	Sap
37.	*Ficus hispida* L. f. [Moraceae]	L: Tote; R: Khsraiti	T	Lf	Ear problem	Juice
38.	*Ficus racemosa* L. [Moraceae]	L: Dumri; R: Uvring	T	Br	Wound, swelling, pain	Sap
39.	*Ficus sarmentosa* Buch.-Ham. ex Sm. [Moraceae]	L: Berulo; R: Bedhum	T	Lt	Gland swelling	Latex
40.	*Cleistocalyx operculatus* (Roxb.) Merr. & Perry [Myrtaceae]	L: Kyamuna; R: Bhuki-jabu	T	Lf	Asthama, sinusitis	Smoking dry leaves
41.	*Mirabilis jalapa* L. [Nyctaginaceae]	L: Malati; R: Lanka-phoola	S	Rt	Bloody urine	Juice
42.	*Piper longum* L. [Piperaceae]	L: Pipla; R: Pipli	H	Rt, Fr	Cough, cold, fever	paste
43.	*Scoparia dulcis* L. [Plantaginaceae]	R: Jhar	H	Lf	Fever and skin diseases	Juice
44.	*Cynodon dactylon* (L.) Pers. [Poaceae]	L: Dubo; R: Duba	H	Wp	Cut, wound, fever	Juice/paste
45.	*Dendrocalamus hamiltonii* Nees & Arn. ex Munro [Poaceae]	L: Bans; R: Pa	S	Sh	Boils	Paste
46.	*Imperata cylindrica* (L.) P. Beauv. [Poaceae]	L: Siru; R: Sirau	H	Rt	Fever	Juice
47.	*Rubus ellipticus* Sm. [Rosaceae]	L: Aiselu; R: Aisyalu	S	Fr, Rt	Cut, wound	Juice
48.	*Murraya koenigii* (L.) Spreng. [Rutaceae]	L: Asare; R: Bokraiti	S	Lf	Scabies	Juice
49.	*Zanthoxylum armatum* DC. [Rutaceae]	L: Timur; R: Timru	T	Fr	Cough, cold, fever	Juice
50.	*Sapindus mukorossi* Gaertn. [Sapindaceae]	L/R: Ritha	T	Br	Backbone pain	Sap
51.	*Schleichera oleosa* (Lour.) Oken [Sapindaceae]	L: Kusum; R: Kushban	T	Br	Joint swelling	Sap
52.	*Datura stramonium* L. [Solanaceae]	L: Dhaturo; R: Dhatur	S	Lf/Fr	Asthma, cough, chest pain	Juice, smoking dry leaf

S. N.	Botanical name and family	Local and Raji name	Habit	Parts used[1]	Disease(s) treated	Forms of use
53.	*Solanum aculeatissimum* Jacq. [Solanaceae]	L: Kantakari; R: Chirain	S	Fr	Dog bite, inflamed wound	Paste of seeds
54.	*Solanum nigrum* L. [Solanaceae]	L: Kamain; R: Jandbi-ruwa	H	Wp	Insomnia	Juice
55.	*Urtica dioica* L. [Urticaceae]	L: Sisnu; R: Sisnau	H	St/Lf	Tonic, tiger/bear bite	Paste
56.	*Curcuma zedoaria* Roxb. [Zingiberaceae]	L/R: Kachur	S	Rh	Blood impurity, heart disease, weakness	Rhizome juice/paste
57.	*Hedychium spicatum* Sm. [Zingiberaceae]	L/R: Gaj Kachur	H	Rh	Heart problem	Paste

[1]Parts use: Br – bark, Fl – flower, Fr – fruit, Lf – leaf, Lt – latex, Pt – petiole, Rh – rhizome, Rt – root, Sd – seed, Sh – shoot, St – stem, Tb – tuber, Wp – whole plant, Ys – young shoot

TRADITIONAL METHOD OF DISEASE CLASSIFICATION

The older people and healers in Raji community have immense knowledge on wild edible and medicinal plants. They have developed their own traditional practice to identify diseases according to symptoms (Table 2). They have classified the diseases into 6 categories such as *Sato Tonthaka, Kapat Brireka, Kokha Mokkaka, Begar, Ban Mokkaka* and *Gandhejera*. Each of the category has some specific symptoms as given in the Table 2.

TRADITIONAL PRACTICES OF KNOWING MEDICINAL PLANTS

Raji people have developed some traditional means to identify the medicinal properties of plants on the basis of 'sap type' found in plant stem and bark. The plants such as *Bauhinia varigata, Desmodium oojeinense* and *Garuga pinnata* having red sap in stem and bark can be used in eye problems and stomach disorders.

The plants such as *Calotropis* and *Ficus* species which produce white sap are used in cuts, wounds, pains and swellings. Plants producing watery sap are used to treat fever. Other plants, which have property of secreting yellowish or greenish sap, are used in toothache, and the plants having thick or viscous sap are used in body pain, cuts and wounds, and also to prevent infection.

Similarly, some plants can be identified as medicinal on the basis of their smell. Raji healers cure stomach disorders by the plants generally having bitter taste and strong smell, whereas the plants having weak smell are used commonly in cuts and wounds. The plants having mild smell (menthol or spicy) are used in cough, cold and chest pain.

IDENTIFICATION OF POISONOUS AND NONPOISONOUS MUSHROOMS

The Raji people also have a good knowledge on mushrooms. Most of the respondents claimed that they are never poisoned by mushrooms. They can identify poisonous and nonpoisonous mushrooms by colour, texture, taste and mushroom morphology (observing volvox and annulus). Another basis of identification of edible mushroom is the type of host plant (Table 3).

Table 2. Traditional method of disease classification by Rajis.

SN	Disease class	Symptoms
1	*Sato tonthaka*	Fever, stomach disorders, sleeplessness
2	*Kapat brireka*	Nausea, stomach pain, loss of appetite, animal infestation in stomach (snake or frog like animals and worms)
3	*Kokha mokaka*	Fast breathing, stomach pain, wheezing respiration, cough, flushed face
4	*Begar*	Loss of appetite, indigestion, flatulence
5	*Ban mokka*	Vomiting, diarrheas and dysentery, skin irritation, giddiness, heat pain, coma
6	*Gandhajera*	Itching, skin inflammation, pimples

Table 3.Traditional method of identification of mushrooms by Rajis.

Grouping characters	Edible mushrooms	Non-edible mushrooms
Colour	White, cream, red	Black, brown, yellow
Taste	Sweet or tasteless	Bitter
Volvox	Absent	Present
Annulus	Absent	Present
Texture	Smooth	Rough
Gills	Septate/Layers	Honey comb like
Host plant	*Shorea robusta* (Sal), *Mallotus* sp. (Royana), *Sapindus mukorossi* (Rittha), *Bombax ceiba* (Simal), *Putranjiva roxburghii* (Pitmari), *Schleichera oleosa* (Kusum), *Terminalia bellirica* (Barro)	*Bauhinia vahlii* (Malu, Bhorla), *Terminalia alata* (Saj), *Terminalia chebula* (Harro)

Discussion

The results show that the Raji people of the study area have strong knowledge and belief in traditional ways of healing practices by using medicinal plants. Thapa *et al*. (2014) had reported 43 plant species belonging to 40 genera and 29 families traditionally used by Raji people of Surkhet and Kailai for the treatment of gastrointestinal disorders. Additionally, this paper gives information on 57 species of medicinal plants traditionally used by Raji people for the treatment of different types of diseases and disorders other than gastrointestinal disorders (Table 1). Most of the trees and herbs are widely used as traditional medicine. Utilization of different plant parts indicated that the Raji people have best practiced on medicinal properties of specific plant parts for treatment of particular disease.

Raji people have their own way of classification of human diseases. *Sato Tonthaka* is one of the classes of diseases, which includes gastrointestinal disorders with fever and sleeplessness. Similarly, stomach pain and loss of appetite are included in *Kapat Brireka* and *Kokha Mokkaka*. Vomiting and diarrhea/dysentery are included in *Ban Mokkaka*, whereas stomach disorders are not included in *Gandhajera* (Table 2). This practice of disease classification indicates that the stomach disorders are the common symptoms of all types of diseases and combined effect of other symptom makes easy to classify disease for appropriate treatments.

Identification of medicinal properties of plants on the basis of sap is important traditional practices. According to the practitioners, species such as *Bauhinia varigata, Desmodium oojeinense* and *Garuga pinnata* have red sap in stem and bark; therefore, they can be applied in eye problems and stomach disorders. Medicinal properties of *Bauhinia varigata* are described by various studies (Parekh *et al*. 2006; Thapa *et al*. 2014) but knowledge on use of *Desmodium oojeinense* and *Garuga pinnata* in stomach disorders is limited. Use of *Calotropis* and *Ficus*, which produce white sap and therefore are useful for the treatment of cuts, wounds, pains and swellings is supported by the findings of Rasik *et al*. (1999), and Joshi and Joshi (2000). Rajis knowledge on application of plants having watery sap for fever, yellowish or greenish sap in toothache, and thick or viscous sap in body pain or cut/wound would be the important basis for exploring chemical constituents and effectiveness of particular medicinal plants.

The taste and smell of plants are important characteristics for the selection of medicinal versus non-medicinal plant species (Leonti *et al*. 2002). Selection of medicinal plants based on taste and smell indicates that the Rajis are the best practitioners of utilization of medicinal plants for curing diseases. According to the practice, plants having bitter and strong smell are used for stomach disorders, plants having weak smell are used in cut and wound, and mild ones are used in cough, cold and chest pain.

Raji people are living near forest resources. The elder people usually go to collect wild fruits, vegetables and mushrooms in jungle (Thapa *et al*. 2014). Knowledge of Raji people is also helpful to identify poisonous and edible mushrooms. They have developed some of the key characteristics by which they can distinguish edible and poisonous mushrooms (Table 3). Their expertise to identify the edible and poisonous mushrooms from colour, texture, taste, morphology and mushroom substrates (host plant species) supports their claim that

they have never poisoned by mushrooms. This knowledge can be applied in scientific identification and distinguishing edibility of mushrooms. Moreover, the documentation and utilization of such knowledge would have great significance to develop conservation and management strategies for valuable plants resources (Ghimire and Aumeeruddy-Thomas 2009).

Overall, Rajis are immense source of traditional knowledge on medicinal plants and mushrooms. They have their own traditional practice to identify diseases according to symptoms. There is risk of extinction of such valuable knowledge due to lack of written documents. Therefore, it is essential to conserve the wealth of information hidden among the Raji people and apply them to modern knowledge of science and technology.

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